



TRANSPARENCY AND RELIABILITY OF TENURE INFORMATION FOR IMPROVED LAND GOVERNANCE: ASSESSING AGRIBUSINESS DYNAMICS IN SENEGAL USING MULTI-SOURCE GEODATA

JEREMY BOURGOIN^{1,2}, ELODIE VALETTE^{1,3}, SIMON GUILLOUET^{1,2}

1: Centre de coopération Internationale en Recherche Agronomique pour le Développement,
France

2: Institut Sénégalais de Recherches Agricoles, Senegal

3: International Food Policy Research Institute, USA

Presenting author: bourgoin@cirad.fr

**Paper prepared for presentation at the
“2016 WORLD BANK CONFERENCE ON LAND AND POVERTY”
The World Bank - Washington DC, March 14-18, 2016**

Copyright 2016 by author(s). All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Abstract

In Senegal, there is a strong demand for improved transparency and reliability of land tenure information from government-related institutions as well as from civil society and NGOs. Our research project proceeds from both these demands. The general objective of this study has been to assess and comprehend agribusiness dynamics in Senegal using multi-source geodata. A critical inventory of the various sources of information delivered a first assessment, which was confronted with other sources of data including satellite imagery. One of the major issues faced by current projects on land deals is the use of punctual assessments and data that originate from different sources (grey literature, research papers, media, etc.) Local communities would strongly benefit from dynamic geospatial information on land acquisitions. The access to -and the control of- this information would inherently increase their negotiation capacity, enhance the transparency in land deals and strengthen the accountability of land investors. To conclude, we discuss future paths of an action-research program based on a participatory mapping methodology that will allow securing and extending the geo-spatial assessment of agribusiness dynamics in Senegal, while being accessible to a majority of stakeholders.

Key Words: Agri-business; governance; participation; Senegal; transparency

INTRODUCTION

It is commonly accepted among international donors and researchers that the challenge of feeding the world requires enhancing quantity and quality of agricultural commodities (FAO, 2009; World Bank, 2007; Godfray et al. 2010; Horlings & Marsden 2011; Smil, 2001). This statement is often related to the urgent need to get smallholders in developing countries out of the cycle of subsistence (Yumkella, Kormawa, and Roepstorff, 2011). Proposed actions include 1) increasing yields in order to generate marketable surpluses by giving access to innovative agricultural technologies and productive assets; 2) improving access to markets by strengthening the linkages between farm-level production and processing and marketing activities; 3) developing commercial agriculture.

For such purpose, the major part of donors and scholars stress the key role of the private sector and foreign investments in the process of revitalizing agricultural production through agribusiness-led development (Konig et al. 2013, FAO/UNIDO, 2010; Byerlee et al. 2013). Agricultural policies go along this path: the Comprehensive Africa Agriculture Development Programme (CAADP), one of the seven pillars of the New Partnership for Africa's Development (NEPAD), is a framework for addressing the challenge of improving agricultural productivity in Sub-Saharan Africa (NEPAD, 2003). It emphasizes the importance of strengthening stakeholders' engagement, encouraging and supporting private sector to invest in agriculture (Brüntrup & Zimmerman, 2009).

Agribusiness, which comprises the collective business activities performed from farm to fork (Konig et al. 2013), is in this paper to be mainly understood as large-scale, industrialized corporate farming. Not only should agribusiness development allow a drastic increase in food production and achieve food security, but it would also offer opportunities for poor people to improve their livelihoods and grow out of poverty at the local scale. It is also said that agribusiness could generate jobs and create opportunities for smallholders, while respecting the right of local communities and protecting environment (Byerlee et al. 2013; Von Braun & Mengistu, 2007).

Sub-Saharan Africa appears as a natural place for the development of this new doctrine: while on one hand food insecurity is of increasingly relevant concern, Africa on the other hand offers abundant natural resources, large and exploitable yields gaps and suitable "marginal or unoccupied lands" (Cotula et al. 2009; Von Braun & Meinzen-Dick, 2009; Deininger & Byerlee, 2010; Borras et al, 2011).

This development model is obviously controversial. Scholars stress the risks of the neoliberal globalization for family farms, wondering whether it would lead to the development of host populations or if it would rather pose new risks to the well-being of the poorest (Von Braun & Mengistu, 2007;

Reardon & Barret, 2000; Vadana et al. 2003).

A number of scholars have specifically underlined the potential risks caused by the global land acquisition phenomenon (Robertson & Pinstrip-Andersen, 2010; Von Braun & Meinzen-Dick, 2009). Foreign agricultural investments could result in “enclaves of advanced agriculture” offering little benefit to the host nations and “resulting in purely extractive neo-colonialism” (Adbib, 2012 ; Hallam, 2009).

Amongst other hindrances, large-scale land acquisitions are usually depicted as poorly negotiated with local farmers and that unfair or nontransparent trade arrangements tend to foster reasonable suspicions and conflicts with and within local communities. Unofficial (e.g. NGO assessments) and official data sources at the country level can show discrepancies, and none may actually reflect reality on the ground. This acknowledgement leads to an urgent need of relevant and accountable data on the forms and dynamics of agribusiness and their interactions with family farming in developing countries (Cotula, 2012). Local communities would strongly benefit from geospatial information on land acquisitions: mapping being “an intrinsically political act” (Peluso, 1995), the access to - and the control of- this information would inherently increase their negotiation capacity, enhance the transparency in land deals and strengthen the accountability of land investors.

In Senegal, there is indeed a strong demand for improved transparency and reliability of land tenure information from government-related institutions as well as from civil society and NGOs. Our research project proceeds from both these demands. The general objective of this study has been to provide dynamic and accurate geospatial information on land acquisitions using multi-source geodata in order to assess and comprehend agribusiness dynamics in Senegal.

This paper first focuses on the Senegal context, expanding on the agribusiness issue and the way it is reported in recent reviews. It then exposes the method used in the project and presents first results on agribusiness dynamics in Senegal. From these results, we delineate future paths of an action-research project that designs a participatory mapping methodology that allows securing and extending the geospatial assessment of agribusiness dynamics in Senegal. We finally discuss the role of accurate geospatial information on land acquisitions on increasing the local communities’ negotiation capacity, enhancing the transparency in land deals and strengthening the accountability of land investors.

METHODS

- **SENEGAL CASE STUDY**

Agriculture in Senegal (including forestry, livestock, and fisheries) accounts for only 17.5% of GDP while about 70% of the working population is involved in farming. Most Senegalese farms are small

family farms (1.5–2.4 hectares/3.7–5.9 acres), and about 60% are in the so-called “Peanut Basin”, east of Dakar. Senegal mainly relies on irregularly rain-fed agriculture, which occupies about 75% of its workforce. Water availability is thus one of the country's biggest agricultural challenges.

Peanuts are the engine of the rural economy with 40 % of cultivated land, which accounts for 2 million hectares, while cotton accounts for about 3% of total exports and is the third source of export earnings for Senegal (some USD 28 million over the period 1995-2000). However these cash crops are declining while horticultural products and grain crops are on the increase.

As a matter of fact, Senegal does not meet its self-sufficiency goals. Production of food crops does not meet Senegal's needs, covering barely 30% of consumption needs. Agriculture remains extremely vulnerable to climatic variations and fluctuations in the international markets of major export of agricultural products. Economic, climatic and sanitary constraints lead to the decline of yields and cultivated surfaces, as well as the increasing number of degrading soils. In addition, there is a lack of resources for the development of irrigation, the purchase of fertilizers, pesticides and mechanical and conditioning equipment. .

These issues have been identified for a long time. The successive Senegalese governments, as well as international donors, have stressed the urgent need for the modernization of agriculture through intensified practices. Following international donors' recommendations, the Senegalese government, hoping to boost the agricultural sector, has gradually liberalized its market since the late 1990's. This policy has been implemented through several legislations and programs, opening the primary sector to foreign investors: this includes the Senegal involvement in the NEPAD (New Partnership for Africa's development, 2002), the vote of the Agro-sylvo-pastoral Act (LOASP) in 2004, the Accelerated Growth Strategy launched in 2005, and more recently the Emerging Senegal Plan (2014), all promoted by FAO, the World Bank and several other international institutions (Rullia et al. 2013).

All these programs clearly emphasize the need for the development of intensive agriculture and export-oriented farms in Senegal, in order to “respond to international demand” (LOASP, 2004). This economic opening of Senegal market has taken place simultaneously with the global rise in the prices of agricultural commodities, which stimulated the interest of financial institutions, agribusiness industries and sovereign wealth funds. The first ones considered it as an economic opportunity and the latter as a means to secure food supplies for governments they depended on. This interest culminated in 2008 with the peak prices of several food products triggering many "food riots" (Cotula et al. 2013; Deininger & Byerlee, 2010).

Senegal market opening to foreign investors and growing interest into developing countries, agricultural lands have therefore led to the development of agribusiness industries in Senegal (Sy et al. 2013).

As previously described, these foreign investments are intended to meet three priority goals, such as the development of food self-sufficiency, the development of food exports and income generation for the farmers, as well as the improvement of basic infrastructures in rural remote and less productive areas helping them to catch-up.

These objectives are indeed controversial and a large number of farmers' organizations, rural stakeholders, NGOs, as well as politicians disapprove these orientations, worrying about the possible land-grabbing over local farmers without land certification, the environmental impact of intensive and unregulated agriculture, the threat to food security due to the development of export agriculture over subsistence crops, and the unwanted and disturbing social changes in the rural communities affected by the development of agri-business industries (Sy et al. 2013; Kanoute et al. 2011; Rullia et al. 2013; Deininger & Byerlee, 2010; Burnod et al. 2013).

Many companies, attracted by the promising prospects and incentive legislation have expressed interests in investing in Senegalese land and agriculture. Many projects have emerged and some of them successfully implemented. However, little information filters on these various projects (area, crop, destination of production, permanent and temporary workforce, etc.) The contracts are not published, and the lack of communication of the government and the agri-business companies makes it difficult to access this information (Anseeuw et al. 2012; Rullia et al. 2013, Deininger & Byerlee, 2010), fueling doubts and distrust among NGO's and local farmers organizations.

Several inventories providing an estimation of the extent of the agri-business farms have been produced since 2011. Here we consider the reports from IPAR (Faye et al. 2011), GRAIN (2012), COPAGEN (Sy et al. 2013) and Land Matrix (online reports 2015, see <http://www.landmatrix.org/>).

The methodologies and the results differ significantly and do not provide geo-information on the land acquisitions made by the agri-business farms over the country. This lead us to propose a new inventory method, partly based on a reasoned definition of the concept of agri-business, the critical inventory of existing sources and the analysis and the mapping of accessible geo-spatialized sources.

- **INVENTORY of AGRO-INDUSTRIAL FARMS in SENEGAL**

The main objective is to identify, document and map the agribusiness in Senegal. This objective is innovative: until now, only the Lao PDR produced a comprehensive inventory and mapping of its agro-

industries. The methodology is particularly interesting because it combines strong cooperation with the authorities, collection and analysis of existing administrative data, GPS survey, satellite imagery analysis and diachronic monitoring. The latter is striking since it reveals the very fast changing dynamics of the industry. In one province, active projects in 2010 represented only 34% of all projects in 2014 (Hett et al. 2015).

In Senegal, previous inventories and assessments were not based on firsthand land inventories and mainly relied on second-hand information (press releases, reports, etc.) Often, the main source of information is the original investment contract between the government and agribusiness companies to which farmland has been assigned. We identify here four limits to these previous studies: i) previous analyses lacked comprehensive definitions of agribusiness and failed to define the required criteria to meet in order to be categorized as an agribusiness (size threshold, type of investments, etc.); ii) most of the collected information has not been verified on the ground with field survey and the collection of GPS points; iii) the investment contract is not necessarily the best source of information, as the lack of mechanisms to enforce accountability provides no incentives for these contracts to be respected; iv) the development of agribusiness is a recent phenomenon and the situation is changing rapidly. As a result, existing contracts could be revised upwards or downwards, whereas intended projects could fail or be implemented without being noticed.

The methodology we propose attempts to address these limitations and is based, as in Hett et al. (2015) on a multi-source analysis. It proposes to 1) define the criteria for identification of agribusiness in Senegal, 2) to pool and verify the data collected in previous inventories, validating or invalidating the information through the observation of satellite imagery as well as the collection of information from civil society on the ground.

○ DEFINING AGRO-INDUSTRIES

Several terms exist to describe these companies investing in the Senegalese agricultural sector: "agribusiness", "foreign investors", "corporate farming" or "private investors in the agricultural sector." From a more controversial perspective of land acquisition and its potentially negative impacts on local agriculture, some scholars describe the phenomenon as "large-scale land acquisition" or "land grabbing". These two terms point out how foreign investments in developing countries may result in a loss of access to land for local populations and/or in the reduction of their incomes and welfare.

The criteria taken into account to describe the agro-industries also vary. Three of them appear to be important to consider: the surface in hectares (ha) of the area concerned, the origin of the investors and the purpose of the agricultural production.

- **The surface:** it is naturally variable, depending on the specificity of national contexts and many others parameters: no size threshold is unanimous. Agro-industries are generally implanted in high profitability farms, which require bigger surfaces than the average area of agricultural land commonly cultivated in the host country. This size varies depending on the cost of the land, local production costs and the value of cultivated products. In 2010, the World Bank provided insights at the global scale by synthesizing data provided by member countries, but did not define a fixed threshold. Among the countries that contributed to the study, the thresholds vary from 500 to 2000 ha (Deininger & Byerlee, 2010). The other two organizations that have provided worldwide inventories (the Land Matrix and the NGO Grain) both set this threshold at 200 ha, without any further justification.

In Senegal, the inventories have a much lower threshold, 20 ha for IPAR and 40 ha for COPAGEN for example. One can explain the gap between global inventories (Deininger & Byerlee, 2010, Grain, and Land Matrix) and Senegalese ones by the difficulty for global players to collect information at a fine scale, and by the choice to characterize in priority large-scale land acquisitions. Nevertheless all these inventories and studies do not define or justify a threshold: the limits will likely depend on the information available.

In this research project, the threshold of 20 hectares has been chosen. The rationale for this choice is as follows: firstly, the average size of farms in Senegal was 3.7 ha in 1960 and 4.3 ha in 1998 (RNA, 1998), i.e. by extrapolation 4.73 ha in 2015. Family farms are smaller and smaller, 20.9% cultivating less than 1 ha while 50.7% own less than 3 ha (RuralStruc, 2010). Finally, 99% of farms cultivate less than 20 ha (RNA, 1998), which makes it a very important land allocation in Senegal. The threshold of 20 ha clearly distinguishes between family farms and agribusiness farms.

- **The country of origin of the investors.** All sources agree to retain all non-national players, whatever their country of origin, including also companies from countries with a low GDP per capita, which includes investors such as Nigerians, Indonesians, and Vietnamese. Although being a minority, these stakeholders seem to play a significant role (see Rullia et al. 2012), despite the fact that the phenomenon of land grabbing is often exclusively attributed to investors from rich countries or linked to sovereign wealth funds (e.g. China, Saudi Arabia). Some sources also take into account the investments made by politicians, religious leaders, farmers or local business men whose investments are similar to foreign investments. These investments are numerous, concern small areas and are often poorly documented. There is a debate within civil society whether to consider them or not. This debate is not closed and given the considerable inventory that it would entail, we only retain the investments made by all non-domestic investors.

- **The destination of agricultural production (export or local market).** The sources generally do not have this information. Nevertheless, at the international level, it is usually recognized that the majority of the production is exported (Shepard & Mittal, 2009). A quick study on data from the Land Matrix (Figure 1) shows that on a sample of 393 farms taken from the worldwide database, 91 farms (23%) are related to both international and national markets, whereas 36 farms (9%) channel their production on local markets. (Anseeuw et al. 2012). For the purpose of this study, we retain every agro-industries without distinction as to the final destination of the products.

INSERT FIGURE 1

In summary, our inventory seeks to identify farms owned by foreign investors, intensively cultivating surfaces over 20 ha, and which production can be either exported or sold on the domestic market.

○ CRITICAL INVENTORY of EXISTING SOURCES and NEW INVENTORY THROUGH MAPPING ACTIVITIES

The allocated time for the purpose of this study was not sufficient to systematically collect and analyze data from government sources (e.g. investment approvals, investment contracts). Time was also lacking for a systematic field inventory. We carried out the analysis in two steps.

First we collected assessments reports on agri-business implementation in Senegal (see previous section). We pooled, compared and analyzed data from the several existing inventories in order to set up a provisional list of the agri-business projects in Senegal. We only selected the projects that fit our definition of agro-industries.

These assessments only rely on the inventory of existing granted contracts without any ground-truthing. Concession areas granted on paper frequently do not accurately reflect conditions on the ground, which can lead to inaccurate assessments and interpretations. However the purpose of this study is to assess the *actual* surface of developed agri-business projects rather than record the allocated surfaces granted in the contracts.

To collect, verify and update the list, location and surfaces of the known developed projects, we set up a second step in the methodology. From the temporary list of agribusiness projects, we systematically verified and completed the accuracy of the information using:

- interviews with local stakeholders
- visualization of agri-business developed projects using earth observation satellite data (Google

Earth)

- ground-truthing field campaigns that consisted of surveying several unreliable investment project sites using handheld GPS equipment, and recording cultivated areas, implementation status and location of projects.

For each project, we collected the following data: Company name, number of parcels, number of hectares for each parcel, number of hectares cultivated, types of crops, implementation date, investors' nationality, and source of information.

RESULTS

- A FUZZY UNDERSTANDING of the AGRIBUSINESS DYNAMIC

Civil society organizations and agricultural unions worry about the potential negative impacts that agro-industries may have on local communities. In fact, concerns have raised *“about the possible social and environmental impacts of large land deals, including loss of land for rural people, and, more generally, about the risk that large-scale investments may marginalize family farming”* (Cotula, 2012:649). As it is often difficult to access accurate figures regarding the expansion of certain agri-industries, several Senegalese NGOs have decided to tackle this issue by quantifying the dynamics at the national scale. Information was widely collected, from press releases to personal contacts within local communities. Two national census were delivered (IPAR, 2011; COPAGEN, 2013). Land deals in Senegal were also described in broader documents that addressed the phenomenon at the international scale (Land matrix, 2015; GRAIN, 2012).

The results in Figure 2 show a large discrepancy in areas cultivated by agro-industries, ranging from 258,700 ha to 678,976 ha. These large disparities are due to differences between the accounted projects. Because of the census dates, knowledge of areas, data collection processes, these reports differ from each other in terms of the information that they convey. Some agribusiness projects are only mentioned in a single census, while some others are described differently. For instance, when comparing the census made by COPAGEN with other information sources, it seems that 15 detailed projects are completely absent from other sources, another 14 are mentioned only by one, two or three other sources and only two farms are confirmed by all other reports. In most cases, the information from the same farm differs on such important details as the name of the company, the location and the area concerned. With the exception of Land Matrix, these draft lists do not come with maps, satellite images or pictures of land which makes their localization difficult.

The major limitation of these sources of information is related to the fact that land deals are described in a very coarse manner and are based on neither georeferenced field data, nor Geographic Information Systems (GIS). No mapping has been done to quantify their approximate surfaces. Most of the numbers found in these reports come from secondary sources, farmers' networks, or leaks during negotiations between State representatives, local communities and the companies. The reports do not include validation processes that would induce verifying the data. Another drawback is related to the fact that these assessments are occasional and often related to projects. In fact, apart from the Land Matrix that incorporates regular updates of the database, the reports cited provide punctual assessments and no revised version with more recent information has been published. Therefore it is impossible to verify whether certain projects have failed or if new projects have been developed. The reports that have been made are much more considered as being a summary of all projects announced at the time of publication than a recent estimation of the actual situation on the ground. Several researchers have already raised this issue:

- “Little scientific information is however available to draw up an objective analysis of this evolution as rapid as recent. Sources remain essentially journalistic and reports by NGOs have strongly presented committed analyzes and probably not always objective” (Brondeau, 2010, p.2)
- “*Land grabbing data are inherently inaccurate and incomplete because of the rapid pace of the phenomenon, its lack of transparency, and the absence of a standard criterion to classify and report these acquisitions*” (Rulli et al. 2013, p.893).
- “*The data comes from a variety of sources including media, international and non-governmental organizations, as well as academic. Various factors may also influence the coverage of the database. One factor is media bias. Another is the effect of different levels of transparency*” (Anseeuw et al., 2012, p.1).
- “*Regional and global inventories have been criticized in the other direction, in particular for trying to shortcut the arduous and labor-intensive process of rigorous data collection and analysis*” (Messerli et al. 2014, p.450).

INSERT FIGURE 2

If Land Matrix allows prompt update of the information, the platform has relatively limited sources for Senegal, generally without maps and without field survey. Hence, the threshold of 200 ha is out of proportion for our Senegalese case study. Whereas Land Matrix is essentially based on succinct descriptions of agribusiness projects, it is interesting to notice that of all the sources, none come from a peer-reviewed article.

The numbers found in these reports must be treated with great caution because contracts are still inaccessible and it is difficult to verify the information. By limiting themselves to these sources, it is difficult to obtain reliable estimations because only one third of the negotiations lead to an actual signature of an agreement and exploited areas only represent a quarter of the advanced areas in the early negotiations (Anseeuw, 2013). For instance in Madagascar, "more than one third of fifty-two announced projects have not progressed beyond canvassing or have been stopped. The sum of areas sought by investors is now up to 150 000 hectares while it amounted to three million hectares in late 2009"(Burnod et al. 2011, p.117).

Similarly in Senegal, some very large projects mentioned do not seem to have materialized. COPAGEN announced for instance a 40,000 ha project by the Dangote company to grow sugar cane; GRAIN highlighted a Chinese investment of 100,000 ha for peanut plantation; IPAR mentioned 10,000 hectares around Thies. Given the gap between the scale of these investments and the total absence of knowledge and media coverage on these investments, we can assume that these projects were only speculative and did not materialize.

- **ASSESSING CURRENT DYNAMICS USING GEO-INFORMATION TOOLS and FIELDWORK**

In the previous section, we highlighted that most of the national census on the dynamics of agribusiness did not include maps, satellite images or pictures of land which made their localization difficult. Interestingly, when maps are available, localization of agribusiness plots is noteasier. Figure 3 displays a compilation of different representations of the agribusiness SenHuile-SenEthanol from official sources. DTGC¹ is the national bureau for geographic anc cartographic information, and SAED² is the government body in charge of agricultural extension services in this part of the country. The last source of information comes from the official website of the company.

INSERT FIGURE 3

Acknowledging this fuzzy representation of agribusiness in Senegal, we used a simple survey protocol to assess the presence of large-scale farms.

At first, 63 unidentified plots could be detected through a scan of Senegal. A manual digitizing of the farms outlines was performed by using ALOS satellite images (2.5 meters of spatial resolution) available

¹ Direction des Travaux Géographiques et Cartographiques

² Société Nationale d'Aménagement et d'Exploitation des Terres du delta, du fleuve Sénégal et des vallées du fleuve Sénégal et de la Faleme

on the Senegalese Geoportal (<http://www.basegeo.gouv.sn/>), Landsat images (30 meters of spatial resolution, available on the USGS geoportal, <http://www.usgs.gov/>) and Google Earth images (30 to 2.5 m of spatial resolution). This digitizing was performed with the following precautions:

- 1- visible presence of a clear delimitation between the outlines of the plots and the rest of the territory (Figure 4)

INSERT FIGURE 4

- 2- Non-continuity of one plot with other fields which have the same characteristics. The objective is to make sure not to mixed up two fields belonging to two different companies (Figure 5)

INSERT FIGURE 5

In order to make sure that all farms were detected before going to the field, this visual analysis was complemented with interviews with Senegalese NGOs working throughout the country and familiar with the issue of agribusiness dynamics. Thanks to the help of a wide network of NGOs and people specialized in certain areas of this region, we identified eleven farms that were not mentioned in any existing census.

INSERT TABLE 1

Four field missions allowed us to map with more accuracy the outline of farms by using a handheld GPS. Reliability indices were thus created accordingly: 0, when we could visualize the agribusiness coarsely, with imprecise indications on the actual location; 1, when we had precise location on the satellite imagery, 2, when we had incomplete GPS coordinates and 3, when we had complete GPS coordinates. The results are depicted in Table 1 where 78 agribusiness projects were identified. As mentioned earlier, this list only identifies investment projects, and nothing is said concerning their possible failure, downsizing or general revision of the possessed and cultivated areas.

Finally, we compared the areas estimated by digitalization of satellite images and those obtained using GPS waypoints. This comparison was used to quantify the error margins between digitization and reality. Figure 6 displays the gap that exists between visual interpretation and field survey data, For the 10 agribusiness surveyed in the field, we found no significant difference between the values originating from the two methods mentioned previously. If this result is important, showing that free satellite imagery data

combined with participatory mapping activities with knowledgeable stakeholders can provide valuable information on the location of agribusiness, the gap will be of important value to precisely assess the impact of such industries on landscapes and livelihoods.

INSERT FIGURE 6

In total, this first mapping has helped digitizing 54,500 hectares, held by 24 agribusiness companies among which 10 that could be verified in the field (Figure 7). Although our assessment is only partial, it has been conducted in the areas where agro-industries are likely to be found and approximately 30,000 hectares have been actually cultivated by agribusinesses. The average farm size (excluding SENHUILE and CSS) is 400 ha. All these projects concentrate in the region of Thies (Figure 8) and in the delta of the Senegal River (Figure 9).

INSERT FIGURE 7

INSERT FIGURE 8

INSERT FIGURE 9

DISCUSSION

In this paper, we stressed the urgent need of relevant and accountable data on the forms and dynamics of agribusiness and their interactions with family farming (Cotula, 2012). As Borras et al. (2011, p.210) argue: “in-depth and systematic enquiry that takes into account the political economy, sociology and ecology of contemporary land deals is urgently needed”. As previously described, the international project, the Land Matrix, was launched by the International Land Coalition and other partners as a global and independent land monitoring initiative. Its intent was to facilitate an open development community of citizens, researchers, policy-makers and technology specialists to promote transparency and accountability in decisions over land and investment. Nevertheless, datasets are hindered from reliable and accurate information. More specifically, the matrix has mainly been designed for an assessment of land deals at a global scale with data aggregated at the country level, which provides a powerful tool for assessing international distribution of land acquisitions and global trends of the land rush (Cotula, 2013), but lacks actionable data for landscape management and fails to answer the request formulated by Borras et al. (2011). If global assessments prove useful in describing trends and sharing information on the global phenomenon of large-scale land-acquisitions, they do not provide insights on the dynamics at a national scale and their representation of agribusiness can hardly be used to understand their impact on landscape largely occupied by family farms. We argue here that in order to reach the goals of

transparency and accountability, there is a need to consider the potential of geospatialized data at the local scale. For one thing, data collection methods should better reflect on the social and spatial dynamics on the ground and take into account the specific context of agriculture development in each country. For instance in Senegal, it would not be rational to focus on very large areas, as a 20 hectare farm already distinguishes very clearly from the average family farms and may have a significant impact on local dynamics and landscapes. Secondly, while a range of studies focus on the impact of agro-industries on small farmers' income, yields, and employment schemes (e.g. contract farming), none so far analyzed the impact of agribusiness land uses on socio-spatial dynamics.

Senegal is characterized by a wide range of agricultural practices in relation to heterogeneous landscapes. The Sahelian societies have progressively tailored their practices in order to fit the constant variability and scarcity of the natural resources. Pastoralism is a typical example of adaptation to the uncertainty in resource distribution by being mobile. If this situation was at the origin of many land conflicts over access and use of resources, it has been modified by the arrival of new actors. With fixed and fenced limits on large areas of land, agro-industries could worsen the conflicts over access to resources. For instance, pastoral resources could become out of reach or would require longer journeys to resources under increasing pressure. The transition from a flexible, fragmented and porous land use to a closed one that is shaped by large cultivated and fenced blocks of land restraining or preventing the mobility of people and herds must not be overlooked. On the other hand, agribusiness could have a positive impact on landscapes and livelihoods, and family farms could benefit from investments made on improving infrastructures (e.g. transportation, irrigation). Our point here is that agro-industries have direct impacts on landscape processes and livelihoods, whether positive and/or negative, that can only be assessed rigorously by integrating precise and spatially explicit data.

In the Global South, access to land is increasingly becoming a critical issue and family farmers, often the major contributors to national agricultural productions, are claiming formal recognition of their customary rights. In many countries, "established procedures for decision-making on land deals do not exist, and negotiations and decisions do not take place in the public realm" (Land Matrix, 2012). Unofficial (e.g. NGO assessments) and official data sources at the country level often show discrepancies, and none may actually reflect reality on the ground. This acknowledgement leads to an urgent need of relevant and accountable data on the forms and dynamics of agribusiness and their interactions with family farming in developing countries (Cotula, 2012). The work described here can be seen as a pilot study, describing the potential use of participatory mapping to assess the dynamics and extent of agribusiness in Senegal.

By highlighting the discrepancies found between different sources of information, we wanted to stress the

need to make accessible better monitoring and evaluation tools, in order to avoid advocacy discourses and decisions being made based on fuzzy estimates. The debate over the role of agribusiness in land grabbing is very pregnant in Senegal and other developing countries. As Burnod et al. (2011) highlighted it, this phenomenon is not only illustrating land tenure issues but also questions the agricultural development models of host countries that often antagonize modern and family farming (Borras & Franco, 2012).

Acknowledging the fact that previous assessments have followed a project-based rationale, the way forward was to focus on how to make spatial methods available to wide range of citizens, willing to contribute to the monitoring of agro-industries. We are then currently working with co-designing a participatory action program (Selener, 1997; Reason, 1998). The methodology we are currently developing (and revolves around) consisted in strengthening an extensive network of farmers throughout the country that could contribute the upscale spatial data. Secondly, we are currently working on facilitating the use of participatory mapping tools, combining both participatory mapping and web-mapping, that is accessible to all stakeholders, yet robust to produce relevant data. Local communities would strongly benefit from dynamic geospatial information on land acquisitions: mapping being “an intrinsically political act” (Peluso, 1995), the access to -and the control of- this information would inherently increase their negotiation capacity, enhance the transparency in land deals and strengthen the accountability of land investors.

The use of participatory data collection tools will be highly relevant in order to complement remote sensing and statistical data. It has already been widely referenced that local development projects have gained from the rapid democratization of Geographic Information Systems and the spread of participatory mapping (Bonin et al. 2001; Rambaldi & Callosa-Tarr 2002; Chambers 2006; d'Aquino 2009; Sandker et al. 2010). Notwithstanding the fact that participatory mapping allows knowledgeable stakeholders to share their insights and valuable information across scales, the assessment executed throughout the observatory is a strong lever for empowerment.

CONCLUSION

The term ‘land grabs’ is often associated to the phenomenon of land acquisitions, and refers to “large-scale (trans)national commercial land transactions” (Borras et al. 2011, p.10). Proponents highlight the economic opportunities that these agricultural investments could lever, whereas a number of authors and NGOs warn against the risks of corruption, and other threats to the rural poor’s livelihoods, including loss of land and a progressive marginalization (GRAIN, 2008, Anseeuw, 2013; Cotula, 2013). Large-scale land acquisitions that have seldom been fairly negotiated with the farmers and unfair trade arrangements

may also recall the colonial power asymmetries between the global North and the global South (Adbib, 2012). Whether the phenomenon is not new and rural communities have lived for centuries with insecure land rights, authors stress that the rate of large-scale acquisitions is rapidly increasing and jeopardizing people's access to land (see Anseeuw et al. 2012). The present study highlights the drawbacks of previous attempts to quantify the extent of large-scale land acquisitions. Focusing on Senegal, we argue that current methodologies lack considering the added-value of geospatial information, which can prove valuable to accurately monitor the dynamics of agro-industries. Hence, such tools can have a considerable impact on transparency and accountability. To conclude, the work presented here is just an initial step in a larger program of participatory action-research with several NGOs of the civil society in Senegal.

REFERENCES

- Adbib, R. (2012). Large Scale Foreign Land Acquisitions: Neoliberal Opportunities or Neocolonial Challenges?, <https://gupea.ub.gu.se/handle/2077/29419>.
- Adamczewski, A. Jamin, J-Y., Tonneau J-P. (2011). Investisseurs versus paysans locaux : vers quelle agriculture irriguée au Mali ?, *Transcontinentales*, 10(11), URL : <http://transcontinentales.revues.org/1113>
- Adamczewski, A. Jamin, Lallau, B., Tonneau J-P. (2012). Investissements ou accaparements fonciers en Afrique ? Les visions des paysans et de la société civile au Mali, *Développement durable et territoires*, 3(3).
- Anseeuw W, Boche M, Breu T, Giger M, Lay J, Messerli P, K Nolte (2012). *Transnational land deals for agriculture in the Global South. Analytical Report based on the Land Matrix Database*, Bern/Montpellier/Hamburg, CDE/CIRAD/GIGA.
- Anseeuw W. (2013). The rush for land in Africa: Resource grabbing or green revolution?, *South African Journal of International Affairs*, 20(1):159-177.
- Borras S.M, Hall R, Scoones I, White B, W Woford (2011). Towards a better understanding of land-grabbing. An editorial introduction. *Journal of Peasant Studies*, 38(2), 209–16
- Borras J, S Franco (2012). Global land grabbing and trajectories of agrarian change: a preliminary analysis. *Journal of Agrarian Change* 12 : 34-59.
- Braun J. von & Meinzen-Dick, R. (2009). “‘Land Grabbing’ by Foreign Investors in Developing Countries. Risks and Opportunities.” *IFPRI Policy Brief*: 9. <http://www.ifpri.org/publication/land-grabbing-foreign-investors-developing-countries> (September 24, 2015).

- Braun J. von & Mengistu, T. (2007). Poverty and the globalization of the food and agriculture system, in J. Von Braun, R.V Hill, R. Pandya-Lorch, *The Poorest and Hungry: Assessments, Analyses, and Actions : an IFPRI 2020 Book*, IFPRI, 584 p.
- Brondeau, F. (2010). Les investisseurs étrangers à l'assaut des terres agricoles africaines, *EchoGéo* (14).
- Brüntrup M., Zimmerman R. (2009). Agriculture as the potential engine for African growth and the role of Nepad, CESifo Forum, 4/2009.
- Burnod P., Papazian, H., Adamczewski, A., Bosc, P-M, Tonneau, J-P., Jamin, J-Y. (2011). Régulations des investissements agricoles à grande échelle, *Afrique contemporaine*, 237(1) :111-129p.
- Burnod P., Tonneau, J-P. (2013). Le foncier : facteur ou marqueur de l'évolution des agricultures ?, *Cahiers Agriculture* 22(4).
- Byerlee, D., Garcia, A.F., Giertz, A., Palmade, V. (2013). *Growing Africa. Unlocking the Potential of Agribusiness*. World bank/AFTFP.
- Deininger K, Byerlee, D. (2010). Rising global interest in farmland. Can it yield sustainable and equitable benefits?, Washington, The World Bank, 214 p.
- Direction de la prévision et des études économiques (2013). Politique Agricole, Productivité et Croissance à Long Terme au Sénégal, Ministère de l'économie et des finances du Sénégal, (25).
- FAO (2009). How to Feed the World in 2050, The Special Challenge for Sub-Saharan Africa, Rome: FAO.
- FAO/UNIDO (2010). ID3A, Initiative pour le développement de l'agri-business et des agro-industries en Afrique, 38 p.
- Faye I.M., Benkahla A., Touré O., Seck S.M., Ba C.O (2011). Les acquisitions de terres à grande échelle au Sénégal : description d'un nouveau phénomène, Dakar, Senegal, : IPAR.
- Godfray, H. Charles J. et al. (2010). Food Security: The Challenge of Feeding 9 Billion People, *Science* 327(5967): 812–18. <http://www.sciencemag.org/content/327/5967/812.short> (September 24, 2015).
- GRAIN (2012). Accaparement des terres et souveraineté alimentaire en Afrique de l'Ouest et du Centre », *A contre courant*, (août 2012).
- Hallam D. (2009). International investments in agricultural production. In: Kugelman M, Levenstein S. (eds) *Land grab? The race for the world's farmland*, Woodrow Wilson International Center for Scholars, Asia Program. http://www.wilsoncenter.org/topics/pubs/ASIA_090629_Land%20Grab_rpt.pdf.
- Hett, C. et al. (2015). Land Deals In Laos: First Insights From A New Nationwide Initiative To Assess The Quality Of Investments In Land , International Academic Conference on « Land grabbing, conflict and agrarian-environmental transformations: perspectives from East and Southeast Asia », 5-6 June 2015, Chiang Mai University, China.
- Horlings, L. G., and Marsden, T.K. (2011). Towards the Real Green Revolution? Exploring the Conceptual Dimensions of a New Ecological Modernisation of Agriculture That Could 'feed the World, *Global*

- Kamara A. & Castel V. (2009). Investissements étrangers dans les terres agricoles d'Afrique : incidence sur le développement du secteur rural et la réduction de la pauvreté, Abidjan, Banque Africaine de Développement.
- Kandeh K. Yumkella K.K., Kormawa P.M., Roepstorff T.M. (2011). Agribusiness for Africa's prosperity, UNIDO, 347 p.
- Kanoute, A.C Diop, N.M., Diallo, C.H (2011). Accaparement des terres en Afrique de l'Ouest. Exporter ou nourrir les populations. Impact sur les consommateurs ruraux, Dakar, Senegal : CICODEV.
- Konig, Gabor, Carlos A. da Silva, and Nomathemba Mhlanga. 2013. *Enabling Environments for Agribusiness and Agro-Industries Development. Regional and Country Perspectives*. Rome: FAO.
- Matsumoto-Izadifar, Y. (2008). Sénégal, pour une meilleure utilisation du potentiel agro-industriel, OCDE
- Messerli P., Giger M., Dwyer M.B., Breu T., Eckert S., 2014, The geography of large-scale land acquisitions: Analysing socio-ecological patterns of target contexts in the global South, *Applied Geography*, 53(september 2014) : 449-459.
- NEPAD, 2003, *Comprehensive African agriculture development program*, Pretoria, South Africa: New Partnership for African Development.
- Observatoire économique et social du Sénégal (1999). *Les unités agro-alimentaires au Sénégal. Bilan et perspectives de développement*, Dakar, Sénégal : Ministère de l'économie du Sénégal.
- Reardon, T., & Barrett, C.B. (2000). Agroindustrialization, Globalization, and International Development: An Overview of Issues, Patterns, and Determinants, *Agricultural Economics* 23(3): 195–205. <http://onlinelibrary.wiley.com/doi/10.1111/j.1574-0862.2000.tb00272.x/abstract> (September 24, 2015).
- Reason R. (1998). *Three Approaches to Participative Inquiry*, in: Denzin, N.K. and Lincoln, Y. (eds), *Strategies for Qualitative Research*, London : Sage, 261-291.
- République du Sénégal (2004). Loi d'orientation agro-sylvo-pastorale (LOASP).
- Robertson, B. & Pinstrup-Andersen, P. (2010). Global Land Acquisition: Neo-Colonialism or Development Opportunity?, *Food Security* 2(3): 271–83. <http://link.springer.com/article/10.1007/s12571-010-0068-1> (September 24, 2015).
- Rullia, M.C., Savoria, A., D'Odorico, P. (2013). Global land and water grabbing , *PNAS*, Vol 110 n°3, 892-897p, 2013.
- Selener D. (1997). Participatory action research and social change, Ithaca, NY : Cornell University Press.
- Shepard D., Mittal , A. (2009). The Great Land Grab: Rush for World's Farmland Threatens Food Security for the Poor, Oakland, CA : The Oakland institute.

Smil, V. (2001). *Feeding the World: A Challenge for the Twenty-First Century*. MIT press.
<https://books.google.com/books?hl=fr&lr=&id=4PuEqWVxyqEC&oi=fnd&pg=PR7&dq=the+challenge+of+feeding+the+world+requires+more+and+higher+quality+agriculture+commodities.+&ots=R9FxHaDHnQ&sig=m6mtpwO45VGnRRU8Jz6XA3EhRIA> (September 24, 2015).

Sy, C.B., Cisse, E.H.T., Ba, S. (2013). Étude participative sur les acquisitions massives de terres agricoles en Afrique de l'ouest et leur impact sur l'agriculture familiale et la sécurité alimentaire des populations locales : État des lieux. Cas du Sénégal, COPAGEN, REDTAC.

Vandana, S. Jafri, A.H., Jalees, K. (2003). *The Mirage of Market Access: How Globalisation Is Destroying Farmers Lives and Livelihoods*. New-Dehli : Navdanya.

World bank (2007). *World Development Report 2008: Agriculture for Development*. New York, NY: Oxford University Press.

TABLE

Table 1. Results of the multi-source assessment

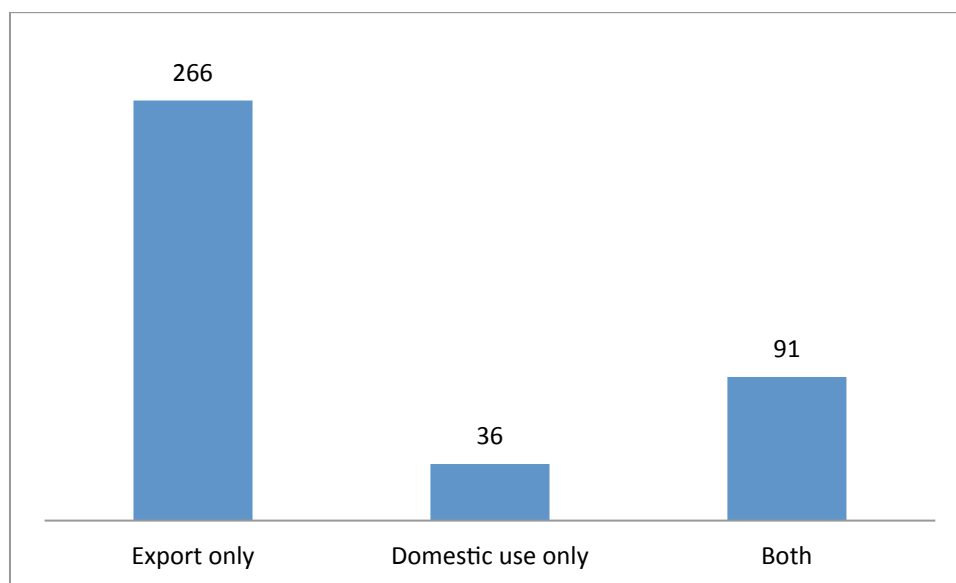
Firms	Number of plots	Contrat (ha)	Fenced area (ha)	Investors origin	Reliability index
Unknown	3	Unknown	340	Unknown	0
CASL	1	Unknown	571	France	1
CHARLES ADAD	1	Unknown	206	Lebanon	3
CSS	6	Unknown	14395	France	1
GUINIABOR	1	Unknown	119	Spain	3
GDS	3	431	418	France	1
SENFruit	1	Unknown	69	Spain	1
Nereo CABELLO	2	Unknown	119	Spain	3
SCL	4	1430	1112	France	3
SEDIMA	3	Unknown	27	Unknown	0
SENEGINDIA	3	Unknown	346	India	0
SENHUILE	4	Unknown	31554	Italy	0

SEPAM	2	Unknown	336	Unknown	3
SOCAS (rented to SCL)	3	Unknown	249	France Senegal	2
SOLDIVE	5	Unknown	94	France	3
SOLEIL VERT	2	Unknown	1213	Unknown	0
STS	1	Unknown	126	Italy	1
VAN OERS	1	Unknown	406	Netherlands	3
VERSEN	1	Unknown	29	Spain	3
VITAL	1	Unknown	137	Senegal	0
WAF	1	300	310	UK	3

Source: the authors

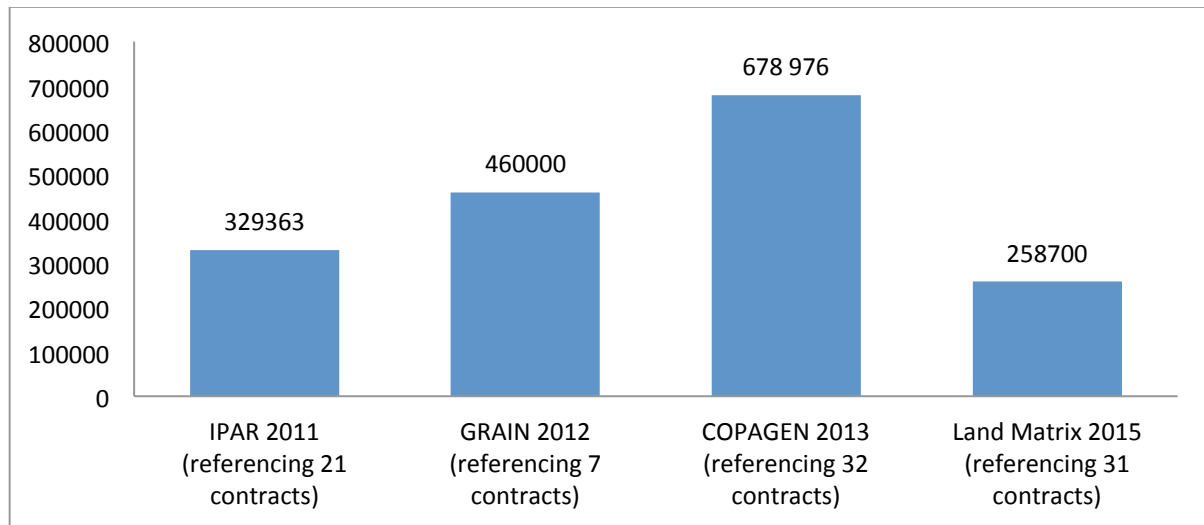
FIGURES

Figure 1. Analysis of the destination of agricultural production from a sample of the Land Matrix database



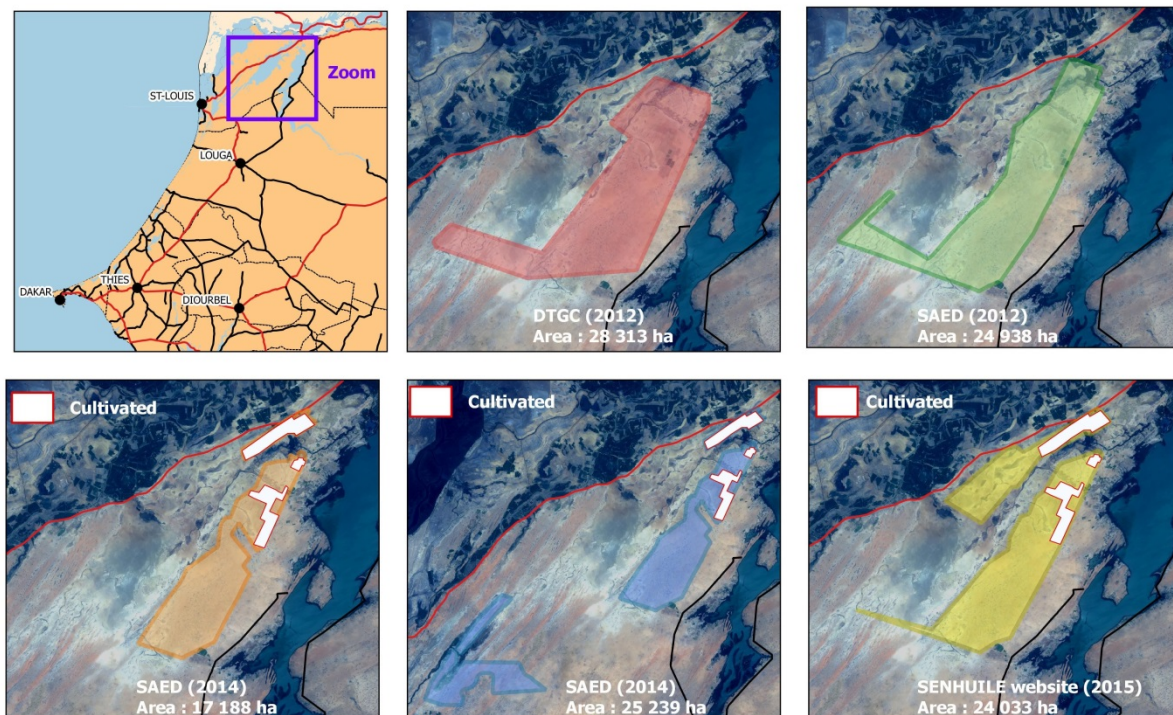
Source: Land Matrix 2012

Figure 2. Areas cultivated by agro-industries from different sources for Senegal



Source: the authors, adapted from IPAR (2011), GRAIN (2012), COPAGEN (2013), Land Matrix (2015)

Figure 3. Spatial representations of SenHuile according to different sources. Cultivated refers to the cultivated areas digitalized using satellite imagery at the corresponding dates



Source: the authors

Figure 4. Well defined agricultural plots



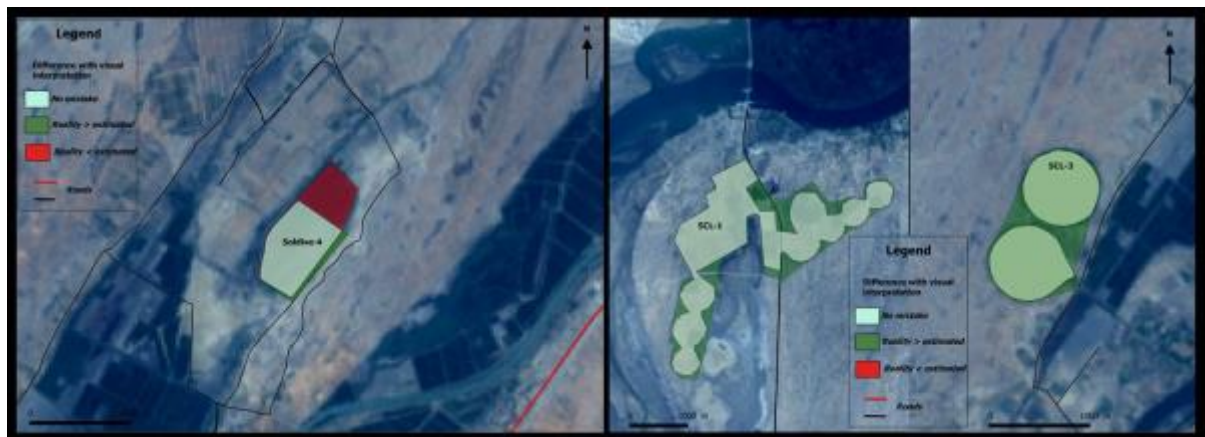
Source: Google Earth

Figure 5. Contiguous plots from different agro-industries and family farms



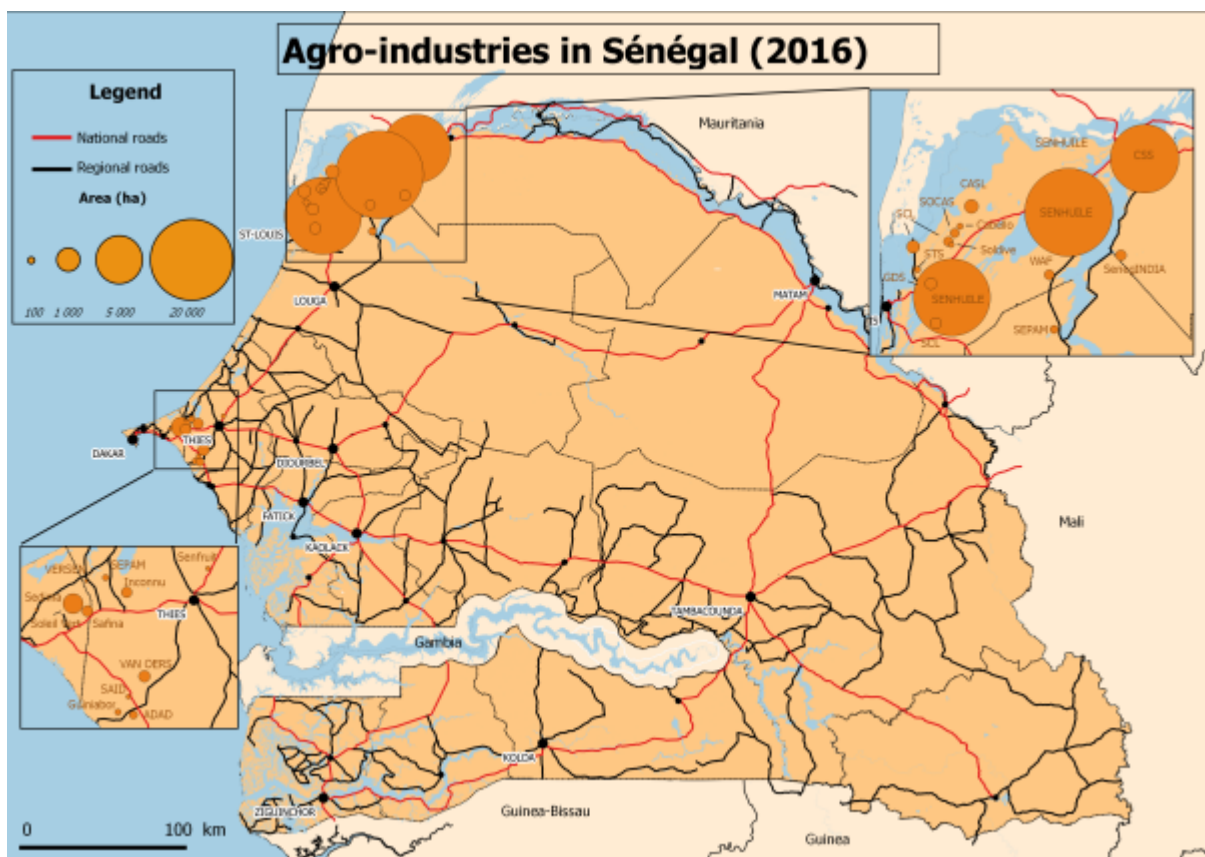
Source: Google Earth

Figure 6. Differences between visual interpretation and field surveys



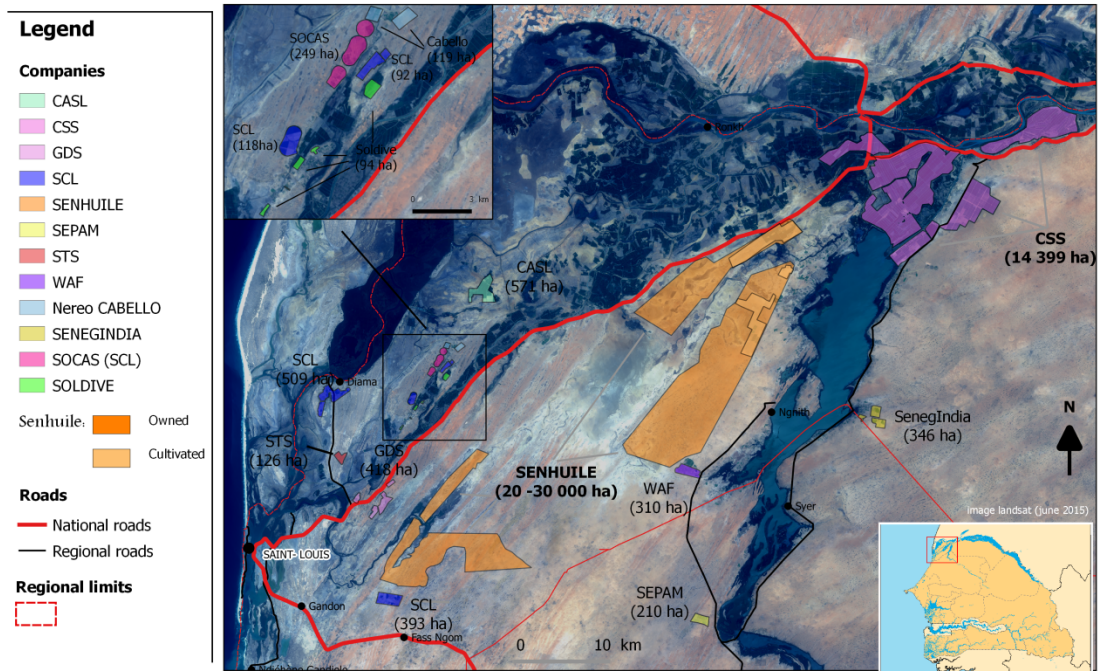
Source: the authors

Figure 7. Presence of agro-industries in Senegal in 2016 (work in progress)



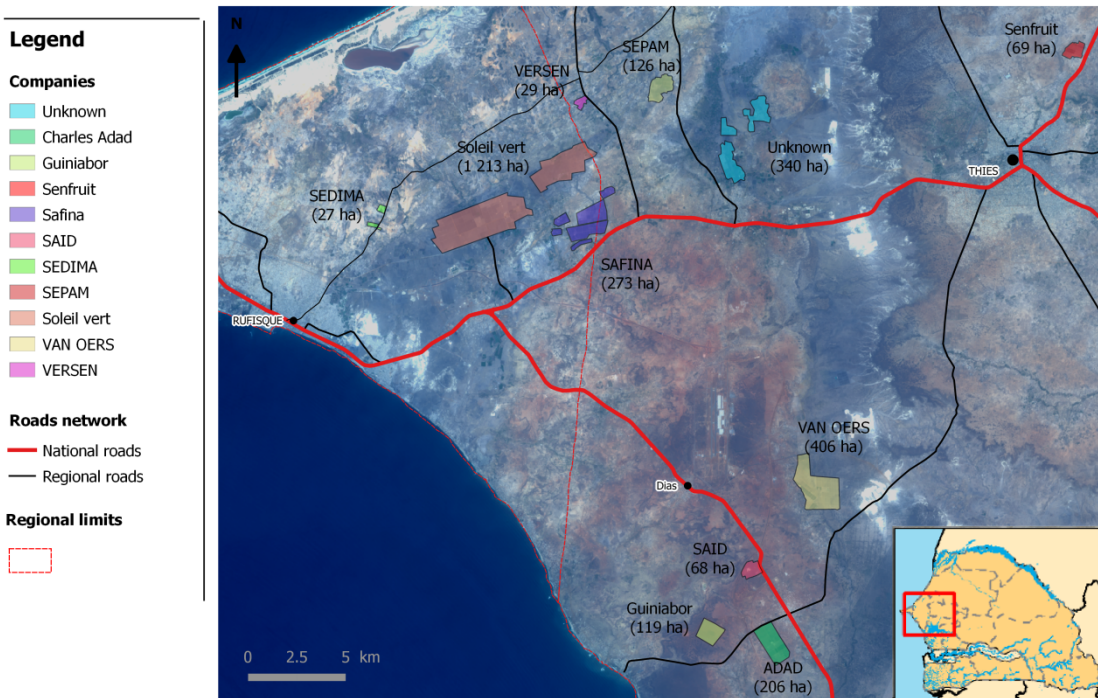
Source: the authors

Figure 8. Agro-industries in the delta of the Senegal River



Source: the authors

Figure 9. Agro-industries in region of Thies



Source: the authors